# CULTURE VALUE OF SCIENTIFIC STUDY

RECENTLY the teachers of Oahu College met in the library of Pauahi Hall for a discussion of the subject "The Culture Value of Scientific Study." The following interesting paper was read by Mr. Miller, after which the teachers occupied an hour in discussions of the various points and arguments advanced.

In beginning a paper on the subject here named it might be well to give some idea of great complexity of topic. This may be done by asking two apparently simple questions: First, "What is culture?" Second, "What is scientific study?" In the latter do we mean scientific method of study, the method now pervading almost all branches of human intellectual activity, or do we mean the study of the more purely scientific branches? To this second meaning we shall best limit this paper.

In considering the question, "What is culture?" opinions could be obtained almost as varied as the human countenance, for in this day of universal education, this day of extended curriculum, this day of university as supplanter of the college, the lines of work are so multiplied in number as almost to equal in number the workers.

What would be the shock to a scholar of a century past if he could return to earth in this era of new methods and see a man graduated from an institution of higher education without having been at the age of twelve at latest to con his Latin declensions, and followed it very soon after with a Greek verb! To him culture without complete mastery of those consummations of human literary genius was an impossibility. He must know all that man had achieved—the heights to which his genius had soared—the beautiful figures of speech and of fancy that his mind had conceived. He must know the history in fact and in fable of this race of his, what empires had come and gone, what cities had tumbled into dreary ruin, what heroes had lived to slay and then been slain. He lived in the past of his own race, a worshiper of his ancestry, a human lover of the human. His inspiration and his conception of what man could do were based upon what man had done. The religion of the Jews was that of their fathers, when Christ came how few could accept him! Their faith, their rites, their worship, were inspired of history, a beautiful history, as we today see well shown in the inspiration of the Old Testament; but by the coming of the Christ God was shown unto us. The way of Abraham, Isaac and of Jacob were human; the way of Christ was divine. Must we cleave to the former to exclude the latter?

So in our culture must we cleave to the works of our ancestors, drawing from them our inspiration, with our eyes blinded to the works of God that are so profusely strewn about us? Shall we exclude science from the elect of culture-study because it "observes not the fast" and by healing our mental infirmities sometimes desecrates the sabbath of the classics?

That man is most cultured who most fully appreciates the world, physical and spiritual, in which he is placed—the world created by the same Power to which he himself owes life and thought. "A world symphony is going on about us, appreciated only by those who have learned to hear." As one more accustomed to written expression has put it: "As our appreciations increase in number our education approaches completion."

If, then, culture consists in learning to appreciate, whence can come better or more varied appreciation than in the study of science? The late Dr. Jos. Leconte, for thirty years an inspiration to the students of the University of California, an authority on geology and biology, and above all and through all a man of God, once gave in his lecture-room the following statement, which I scribbled in the margin of my text-book: "The will of God works according to law, which it is the privilege of man to study and in some measure appreciate." The privilege of that appreciation belongs to him who would be cultured and what a reward there is for his effort!

But to whom shall we turn in this study of science, this progress in the appreciation of things? To an ancient race, that has handed down to us a heritage of manuscripts? Latin would avail us little, for their philosophy was inherited. They "took the word" of an earlier civilization—a philosophy that maintained the earth and all things as composed of various combinations of four elements—earth, air, fire and water—not so bad a beginning (as a full discussion would bring out), but insufficient because a mere beginning. Such a beautiful and fascinating theory, too, it would seem a pity to alter it, and above all a profanation of the sacred thought and the law of our intellectual ancestors. What wonder, then, that this conception should prevail almost unaltered through a renaissance? A period that revived an old learning would naturally accept the views of Greek philosophy as to the constitution of matter. When wood burned the element fire was set free and the wood disappeared almost entirely. It was all simple enough and had all been thought out centuries ago by a Greek philosopher who thought out everything, and how perfectly simple after he had thought it out!

Through the long period of the alchemists when men tried to turn base metals to gold, this view held good in its general form. A substance burned and in so doing gave off this element of fire, which was named phlogistore. For five centuries men experimented blindly in their efforts to manufacture gold, learned a ponderous mass of unclassified facts and never dreamed but that a philosopher a thousand years ago living in a tub or walking with his followers in "the midst of Mars Hill," had solved the whole question by thinking it out. How much culture value was there in the study of alchemy? A seeking merely of one end—the making of gold?

A century and a quarter ago three men working independently discovered at almost the same time the element, oxygen. The processes they employed were almost identical as far as the discovery was concerned. A Swede, an Englishman and a Frenchman discovered this new island in the sea of the unknown at the same time. The Swede and the Englishman gathered a few of its fruits and returned again to the land of their fathers. To the Frenchman, Lavoisier, it was left to show that there was a whole new world stretching back from the shores they had landed upon.

Lavoisier was a searcher for truth, and was so bold as to wish to prove for himself whether or not a substance, phlogistore, was given off in burning a body. What now seems so simple to us appears to have been first thought of by Lavoisier. Nor to sit down and think about it, then see how the facts could be made to fit the theory, but to observe facts and then profound a theory deduced therefrom. This Lavoisier did, and by a few careful experiments with several substances, weighing before and after burning, found not only that the substances lost nothing, but on the other hand gained in weight by a large percentage, and that this gain was equal to a certain loss sustained by the atmosphere surrounding the burning body. This overturning of the phlogistore idea was not accepted without much controversy and very careful experimentation, all of which added to its strength.

The point once gained and a score or more other truths were precipitated. The science of chemistry was born. Alchemy in search of gold had given place to chemistry in search of truth, and for the love of truth. Apriori speculation had given place to aposteriori knowledge. Law was established in the anarchy of accumulated facts, and men began to appreciate chemistry as a profound science governed by laws as unchanging as the universe.

Chemistry has been taken only as an example; any other science might be mentioned with equal fitness, for a second renaissance was at hand. Immediately before and after Lavoissier, other men in other branches were likewise inspired. The harmony of the spheres under Kepler's laws became as beautiful a tribute to the Creator who, in His own way, set them moving in their orbits, as the mythical song of the stars was to the mortal mind that conceived the beautiful myth. The mysterious process of birth and growth of plant and animal, the great plan of the Creator in bringing of new forms into existence became "a wondrous story book thy Father hath written for thee," more wondrous even than the mind of man had conceived in his mythology, more wondrous, more beautiful, and not least, more true.

How was it done in so short a time? we may ask. By men who were willing to work years before trusting themselves to express a theory.

But can we call this a second renaissance?

Can we call this a reawakening? Perhaps better a birth—the birth of a new method in the progress of human culture—opening up a new world of knowledge.

In comparing the culture value of science with that of the classics, let us consider several of the points for which study of the classics has been so strenuously upheld, e. g., mental discipline in the languages, narrative in history, cultivation of the imagination in mythology, and appreciation of the beautiful in all.

I wish to uphold the idea not that science is pre-eminently the study in all these respects, but that it is quite the equal in every way of the branches known as purely classical.

In the matter of mental discipline we must consider the memory and the reasoning power. The physical sciences—physics and chemistry, passing into astronomy—can surely find no superior for training the mind that is adapted to them. In memory exercise the mastery of chemical formulae and equations, of the various equivalents and laws of action in physics, the planetary movements and star magnitudes in astronomy can surely compete with the inflections of a language or the variety of sentence construction.

In narrative we have geology. Is not the life of an ancient kingdom rivalled in interest by a geological age, its mighty heroes by the gigantic animals that lived before us, its wats, its customs, its tribes by the struggles, the habits and the various groups of its animals, the keen zest of reading its history in ancient inscriptions or parchment by the achievements of the geologist in reading the stories in rock and fossil tooth or foot print? Is not the economic study in tracing the development of civilization by birth and death of generation on generation of empires equaled in wonder when we trace step by step in these unimpeachable records the evolution of a more perfect animal by birth and death of generations now extinct? How truly so when we find in the end that the former is but a niche in the edifice of the latter.

Is there no training of the imagination in science? Must the scientist become a mechanical searcher for fact and lose the power to build fancies about the objects and forces with which he works? In the summer of '99, on a geological expedition through the head waters of the Columbia, we were encamped in a large amphitheatre-like valley, through which flowed the John Day river. From its edge the banks rose abruptly for a distance, then a more level plain, then rose the amphitheater, in terraces 50 to 100 feet in each, almost a score in number, to the summit of the encircling hills, more than a thousand feet above. To the unimaginative eye alone there was unmistakable proof that there had been a succession of upheavals of the land, carrying with it the river on its back. In the intervals the river had cut down its bed and was still cutting. But how easy to personify these monster forces struggling there in this colossal amphitheatre, the one to throw off its enemy by violent upheaval, the other to conquer by the more quiet but constant wearing away of the strength of its adversary; how easy to people these terrace benches with the giants of the mountain, old grizzled Titans, who sat and watched the struggle below and applauded in the thunder!

Is there for the geologist, for the astronomer, for the naturalist, no appreciation of the sublime, of the beautiful, of the infinite? Is the sacredness all lost sight of and must we turn to the works of men for our culture?

A thousand friendships are made by him who learns the ways of the birds and flowers, and nothing can teach him to feel greater joy than when they speak to him words that he can understand. A ride around Diamond Head last week put a handful of small brown seaweed in my collecting pouch. Half an hour with them under the microscope and the introduction was complete, they had received me into their home and I them into mine—we are now good friends forever, and how much more a little brown scrap of seaweed means since my real eyes have seen it!

It is without the limits of this paper to consider the technical training resulting from scientific study, the use of the hands in the laboratory, the ability to do things, the correlation of the mind and body. Yet what can be more truly culture than the cultivating of such harmony between thought and action? The keen deductive method of reasoning is the result of science study. The discussion thus far has been to demonstrate the equivalence of scientific branches to classics in producing the effect that classics were claimed to produce. In abandoning the idea that classics were the only culture studies, can we not also enlarge our ideas of culture to include the entire being—the body as a unit? Let it mean the fitting of man into his surroundings, increasing the harmony by increasing the understanding, increasing the faith from an unseeing belief into an enlightened understanding the more perfect as we approach nearer the truth.

During a hot debate Tillman challenged his colleague, McLaurin, to resign, so that they could fight out their battle at home, but nothing came of it.